

Impact Of Flood Exposure On Self-Esteem Among Female Adolescents In Kerala: A Comparative And Covariate Analysis

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Abstract

Background: Floods are recurring natural disasters that significantly affect psychosocial well-being, particularly among vulnerable groups such as female adolescents. In Kerala, repeated flood events have disrupted developmental environments, potentially influencing adolescents' self-esteem. However, limited research has examined the role of socio-demographic factors alongside disaster exposure.

Methods: The study adopted a quantitative comparative design with a sample of 780 female adolescents from flood-affected (n = 375) and non-affected (n = 405) regions of Kerala. Data were collected using a socio-demographic information sheet and the Rosenberg Self-Esteem Scale. Statistical techniques included independent samples t-test, linear regression, and ANCOVA.

Results: A statistically significant difference in self-esteem was observed between flood-affected and non-affected groups ($p < .05$), although the effect size was small (Cohen's $d = .141$). Age did not significantly predict self-esteem ($p > .05$), whereas annual family income showed a weak but significant negative association ($p < .05$; $R^2 = .006$). However, after controlling for age and income, flood exposure did not have a significant effect on self-esteem ($p > .05$), indicating the influence of underlying contextual factors.

Conclusion: The findings suggest that flood exposure alone does not substantially determine self-esteem among female adolescents. Instead, socio-demographic and contextual factors play a more critical role. The study highlights the need for gender-sensitive and context-specific psychosocial interventions in disaster-prone regions.

Introduction

Floods are the most common and devastating natural disasters. Such catastrophes create considerable negative impacts on humans, their psychological health, and infrastructures. Climate change over the past few years has increased the frequency of floods in developing nations, including India (Young et al., 2022). India has had repeated instances of floods resulting in destruction in lives and properties of the people. Kerala state has had two disastrous floods in 2018 and 2019, causing loss of life, mass displacement, and livelihood disruption. The aftermaths of the affected population have been immense (Azzali et al., 2020). Besides the physical impacts, floods cause severe mental health implications, especially among vulnerable individuals such as women and adolescents.

The repeated flooding cases in Kerala point out not only the existence of environmental disaster but also psychological ones. Being exposed to disaster conditions such as displacement, loss of property, disruption in education and uncertainties about the future, a person becomes psychologically stressed. Adolescents who go through important stages of identity and emotional development become especially vulnerable to this type of disruption. Though they are considered the biggest age group, adolescents tend to be ignored when studying disasters as people think that they have higher coping skills than children (Azzali et al., 2020). There is evidence that experiencing disasters during this period causes significant psychological damage.

The adolescence period, traditionally between 10 and 19 years of age, is the most critical period characterized by numerous physical, emotional, and mental changes. During this stage of life, adolescents undergo important development processes such as building self-concept, peer relationships and identity formation (Harrington et al., 2015). Floods, like other environmental stresses, can seriously influence this process and cause problems with emotional stability, behavioral difficulties and social functioning. Adolescents facing disaster conditions experience fear, anxiety, helplessness and disturbing memories of the trauma that can remain with them for a long time (Annalakshmi, 2019). Short-term consequences include sleep disturbance, irritability, difficulty concentrating and

physical complaints. The long-term implications can consist of depression, anxiety disorders and even post-traumatic stress disorder (Sinclair et al., 2016). It should be noted that female adolescents constitute a special vulnerable subgroup of people. The research results show that girls are more likely to experience problems such as anxiety, depression, and emotional distress after trauma (Sharma et al., 2023). Gender roles usually imply that girls need to have high emotional sensibility, dependency and interpersonal relations that make them more vulnerable in case of disaster conditions. Female adolescents, faced with disaster, experience more problems such as limited mobility, additional domestic responsibilities and lack of resources and support network (UNICEF, 2019). All this not only causes more psychological stress but also influences how girls see themselves and operate socially.

Self-esteem, the term referring to individual assessment of oneself, is a very important aspect of adolescent development and psychological health (Paria et al., 2023). This concept in this age period is especially dependent on environmental influences, including social relations, academic experiences and life events (Huang et al., 2022). Disasters such as floods can destroy self-esteem by interfering with normal routine, displacement from familiar environment and changing social relations (B. George et al., 2022). In case of females who are usually closely tied with social validation and peer relationships, such disruption can result in great impact on self-concept. Several studies have found the correlation between low self-esteem and vulnerability to depression, anxiety and poor coping strategies (Mohapatra et al., 2022).

The empirical data clearly illustrates gendered implications of disaster consequences. The research carried out in Kerala after 2018 floods showed that females demonstrated a higher level of psychological distress that included symptoms of PTSD, anxiety and depression compared to males (Azzali et al., 2020). Similar results have been found in the research that focused on females' vulnerability in disaster situation. They pointed out that resource availability, financial independence and information networks had a big impact on coping with disaster (Mohapatra et al., 2022). This means that female adolescents, having limited resources and autonomy, are more vulnerable in disaster situations (Kumar et al., 2023). Floods affect peer relationships too, which are essential in the socialization process and in psychological development of adolescents. Peer relationships offer emotional support, help in identity development, and the development of social skills (Shaji & Macwan, 2017). These relationships may be interrupted due to displacement of adolescents, disruption of schooling, and changing social networks (Mathew et al., 2021). According to scientific research, disruption of peer relationships results in increased feelings of isolation, loneliness, and low self-esteem among adolescents (Varughese & Purushothaman, 2021). Female adolescents, who depend much on peer relationships for emotional regulation, may suffer greatly in case of such disruptions.

Another variable that affects adolescent's experience of disasters is the concept of resilience. Resilience means adapting successfully to negative experiences. Some adolescents may adapt well in disaster situations and recover from negative experiences, while others may struggle in adapting to their new life situations (Joseph et al., 2020). Many studies have found out that resilience depends on many factors including personal traits, social support, and the environment (Jose & Fenn, 2021). Gender differences in the level of resilience have also been established. Female adolescents have reported lower levels of resilience than male adolescents, especially when they are experiencing social and economic hardships (Panigrahi & Suar, 2021). However, despite the increasing amount of literature about the effect of disasters on people, there has not been much focus on the psychosocial variables other than the clinical ones. Most research has been conducted focusing mainly on clinical issues such as PTSD and depression. Little attention has been paid to other psychosocial variables like self-esteem (Jose & Fenn, 2021). Besides, the majority of research is generalized and lacks a specific perspective concerning gender-specific experiences. Literature about adolescents in disaster settings is also limited with very few studies examining the joint effect of floods on adolescents' mental health and self-esteem, especially female adolescents in India. Literature lacks comparative studies on the difference between flood-exposed and non-flood exposed populations.

Various theoretical approaches can be used to describe the influence of disasters on adolescent development. Phenomenological Variant of Ecological Systems Theory (PVEST) underlines the importance of personal perception and socio-cultural context in shaping the results of the development (Harrington et al., 2015). The described framework is especially useful when it comes to interpreting the disaster experience of female adolescents from the perspective of their social environment. In addition, the Transactional Model of Stress and Coping can help understand the processes of appraisal and coping with stress (Baaleis & Ali, 2018). Furthermore, the Dynamic Disaster Model describes the phases of human reaction to disasters, thus allowing for the understanding of the timeline of reactions of people to disasters (Bak et al., 2023). All of the described models highlight that there are

individual, social, and contextual factors that determine the influence of disasters on people. These factors include the norms associated with gender, family relations, availability of resources, and functioning of the social support system. The understanding of the interactions between the factors is necessary for designing effective interventions to promote mental health of the population affected by disasters.

With regard to these factors, the current research pays attention to the influence of floods on the mental health and self-esteem of female adolescents in Kerala. The comparison of the groups of flood-affected and unaffected adolescents allows for gaining a comprehensive understanding of the influence of exposure to the disaster on the psychological states. Furthermore, the research is supposed to pay attention to the role of such socio-demographic variables as age and annual family income in shaping the self-esteem of female adolescents. It is worth mentioning that the current study makes an attempt to fill the gap in literature regarding this issue by adopting the gender-sensitive perspective and involving multiple psychosocial and contextual variables.

In order to do so, the current research is supposed to address the problem and test the following hypotheses. Thus, it is assumed that there will be a difference between self-esteem levels of female adolescents exposed to flood and those who have not been affected by the disaster. In addition, the researchers should identify the influence of age and annual family income on self-esteem. In addition, the interaction between disaster exposure and the selected socio-demographic variables should be studied.

Objectives of the Study

Accordingly, the study pursued the following objectives:

1. To compare the level of self-esteem among female adolescents from flood-affected and non-affected regions of Kerala.
2. To examine the influence of age on the self-esteem of female adolescents.
3. To assess the influence of annual family income on the self-esteem of female adolescents.
4. To determine the effect of flood exposure on self-esteem among female adolescents after controlling for age and annual family income.

Hypotheses of the Study

The study was guided by the following null hypotheses:

- H_01 : There is no significant difference in the level of self-esteem between female adolescents of flood-affected and non-affected regions.
- H_02 : Age does not significantly influence the self-esteem of female adolescents.
- H_03 : Annual family income does not significantly influence the self-esteem of female adolescents.
- H_04 : There is no significant effect of flood exposure on self-esteem among female adolescents after controlling for age and annual family income.

Methodology

Study Design

The present study adopted a quantitative and comparative research design to examine the impact of flood exposure on the self-esteem of female adolescents in Kerala. The design enabled comparison between adolescents from flood-affected and non-affected regions and facilitated the examination of demographic influences such as age and annual family income. Further, a covariate-based analytical approach was employed to determine the effect of flood exposure on self-esteem after controlling for selected background variables.

Population of the Study

The population of the study comprised female adolescents studying in secondary and higher secondary schools in Kerala, India. The population included adolescents from both flood-affected and non-affected regions, allowing for a comparative understanding of disaster impact. Kerala was selected due to its recurrent exposure to severe floods and the associated psychosocial challenges. The focus on female adolescents was based on evidence suggesting that adolescent girls may experience and internalize disaster-related stress differently due to socio-cultural and emotional factors.

Sample of the Study

The sample consisted of 780 female adolescents selected from both flood-affected and non-affected regions of Kerala. Out of the total sample, 375 participants were drawn from flood-affected regions, while 405 participants were from non-affected regions. All participants were within the adolescent age range and were enrolled in recognized educational institutions at the time of data collection. The sample size was considered sufficient to ensure statistical reliability and meaningful comparisons.

Sampling Technique

A multistage sampling technique was used for participant selection. Initially, the districts of Kerala were categorised into flood-affected and non-affected regions based on official flood impact reports. Subsequently, schools were selected purposively to ensure inclusion of eligible participants. In the final stage, female adolescents were selected using convenience sampling based on their availability and willingness to participate. This approach was adopted considering practical constraints such as accessibility and time, while efforts were made to include participants from diverse socio-economic and geographical backgrounds.

Tools for Data Collection

Data was obtained through the use of socio-demographic information sheet and the Rosenberg Self-Esteem Scale. The socio-demographic information sheet was self-developed in order to obtain details on age, family annual income, and whether area of residence was affected or not affected by flood. These variables were used for descriptive analysis and inferential statistics.

Self-esteem was assessed using Rosenberg Self-Esteem Scale (RSES) developed by Rosenberg (1965). This is one of the common tools used for assessment of global self-worth. Rosenberg Self-Esteem Scale has 10 statements with five being positively worded and five being negatively worded statements that are rated using 4-point Likert scale where 1 indicates Strongly Agree, 2 indicates Agree, 3 indicates Disagree, and 4 indicates Strongly Disagree. The negatively worded statements were reverse scored while total score obtained ranged from 10 to 40, with 40 having highest self-esteem. In order to interpret scores, scores between 30 and 40 have high self-esteem, between 20 and 29 have moderate self-esteem, and between 10 and 19 indicate low self-esteem.

The Rosenberg Self-Esteem Scale has very good psychometrics. It has very good internal consistency with Guttman coefficient of reproducibility of 0.92. Test-retest reliability coefficients over a period of two weeks range between 0.85 and 0.88. There are very good construct and concurrent validity since the tool is able to measure construct of interest and correlate with other established self-esteem measures. There is also predictive validity since the tool predicts relationships with other psychological constructs like depression and anxiety.

Procedure for Data Collection

Data collection was done systematically but within ethical considerations. Permission had already been sought from the management of selected schools in both the affected and unaffected areas. The objective of the research was clearly explained to the respondents, and their consent was sought for their participation. They were assured of anonymity and confidentiality in their responses, and that participation would be on a purely voluntary basis.

The instruments were administered by the researcher in groups within the classroom setting. Adequate instructions were given, and the participants were encouraged to provide honest answers. A relaxed and non-threatening atmosphere prevailed during the administration of the data collection instruments. Once the questionnaires were completed, they were collected, reviewed for completeness, and coded for analysis.

Results

The present study examined the impact of flood exposure on the self-esteem of female adolescents, along with the influence of age and annual family income. Prior to inferential analysis, assumptions of normality and homogeneity were assessed and found to be satisfied.

Table 1 Homogeneity of Variances Test (Levene's)

	F	df	df2	p
Self-esteem	0.503	1	778	0.478

Note. A low p-value suggests a violation of the assumption of equal variances.

Table 2 Independent Samples T-Test

		Statistic	df	p		Effect Size
Self-esteem	Student's t	1.97	1.97	0.049	Cohen's d	0.141

Levene's test for homogeneity of variances indicated that the assumption of equal variances was met for self-esteem scores between flood-affected and non-affected groups, $F(1, 778) = 0.503$, $p = .478$ (table 1). An independent samples t-test revealed a statistically significant difference in self-esteem between the two groups, $t(778) = 1.97$, $p = .049$. However, the effect size was small (Cohen's $d = 0.141$), indicating limited practical significance despite statistical significance (table 2).

Table 3 Model Fit Measures

Model	R^2	Overall Model Test			
		F	df1	df2	p
1	0.00101	0.783	1	778	0.376

Table 4 Model Coefficients - Self-esteem

Predictor	Estimate	SE	t	p
Intercept	2.94042	0.1569	18.741	< .001
Age	-0.00985	0.0111	-0.885	0.376

To examine the influence of age, a simple linear regression analysis was conducted. The overall model was not statistically significant, $F(1, 778) = 0.783$, $p = .376$, with a negligible variance explained ($R^2 = 0.001$). The regression coefficient for age was not significant ($\beta = -0.010$, $p = .376$), suggesting that age does not meaningfully predict self-esteem among female adolescents (table 3 and table 4).

Table 5 Model Fit Measures

Model	R	R^2	Overall Model Test			
			F	df1	df2	p
1	0.0801	0.00641	5.02	1	778	0.025

Further, a regression analysis was conducted to assess the influence of annual family income on self-esteem. The model was statistically significant, $F(1, 778) = 5.02$, $p = .025$, though the variance explained was minimal ($R^2 = 0.006$). The regression coefficient indicated a small but significant negative relationship ($\beta = -0.021$, $p = .025$), suggesting that higher income was associated with slightly lower self-esteem, although the effect size was weak (table 5).

Table 6 Model Coefficients - Self-esteem

Predictor	Estimate	SE	t	p
Intercept	2.8525	0.02511	113.60	< .001
Annual Income	-0.0207	0.00923	-2.24	0.025

Result of the linear regression analysis revealed that annual income significantly predicted self-esteem, $\beta = -0.0207$, $SE = 0.00923$, $t = -2.24$, $p = .025$. The findings indicate a small but significant negative relationship between annual income and self-esteem (table 6).

Table 7 Homogeneity of Variances Test (Levene's)

F	df1	df2	p
0.517	1	778	0.472

Finally, an analysis of covariance (ANCOVA) was conducted to examine the effect of flood exposure on self-esteem while controlling age and annual family income. The assumption of homogeneity of variances was satisfied, $F(1, 778) = 0.517$, $p = .472$ (table 7).

Table 8 ANCOVA - Self-esteem

	Sum of Squares	df	Mean Square	F	p	η^2
Overall model	0.6654	3	0.2218	2.776	0.040	
Annual Income	0.3610	1	0.3610	3.805	0.051	0.005
Age	0.0405	1	0.0405	0.427	0.514	0.001
Area	0.2640	1	0.2640	2.782	0.096	0.004
Residuals	73.6170	776	0.0949			

The overall model was statistically significant, $F(3, 776) = 2.776$, $p = .040$, indicating that the combined predictors explained a small proportion of variance in self-esteem. However, the main effect of flood exposure was not statistically significant after controlling for covariates, $F(1, 776) = 2.782$, $p = .096$, $\eta^2 = .004$ (table 8). Age also remained non-significant, while annual family income approached significance. The adjusted mean scores indicated only marginal differences between groups, suggesting that flood exposure does not independently influence self-esteem when demographic variables are accounted for.

Discussion

This current study aimed to determine the influence of floods on the self-esteem of teenage females in the state of Kerala, taking into consideration socio-demographic factors such as age and yearly family income. The results obtained provide a lot of valuable information regarding the specific and highly context-dependent nature of psychological responses to disasters among young female adolescents.

The findings indicate that there is a statistically significant difference in self-esteem levels of teenage females living in areas affected by floods and teenage females living in unaffected areas. However, at the same time, the effect size is quite small. In other words, it may be stated that flood exposure does influence self-esteem but not significantly. This conclusion is consistent with previous literature that has established the connection between disasters and negative psychological responses in adolescents due to the experience of being displaced and losing possessions (F.

E. George et al., 2022). At the same time, research conducted among adolescents affected by disasters in China and Nepal has shown that trauma exposure leads to such psychological disorders as post-traumatic stress, depression, and anxiety; in addition to this, household stressors, interpersonal conflicts, and economic insecurity worsen the situation (Newnham et al., 2022). However, the small magnitude of the effect obtained shows that adolescents have a certain capacity for adaptation to negative influences, which allows maintaining self-esteem levels at a relatively high level (Jose & Fenn, 2021).

What is noteworthy is the fact that after taking into consideration socio-demographic variables (age and yearly family income), the effect of flood exposure on self-esteem disappears. Thus, the differences in self-esteem are not only related to exposure to disaster but are determined also by socio-demographic factors. The elimination of flood exposure effect after adjustments for socio-demographic variables implies that psychological responses of female adolescents to disasters depend mostly on contextual factors. This conclusion corresponds to research emphasizing the significance of contextual factors such as socio-economic status and availability of resources for vulnerability and recovery from disasters (Joseph et al., 2020). The study has also shown that age does not significantly affect the self-esteem of female adolescents. Such a conclusion can be made since self-esteem of the studied participants remains relatively stable at different ages in the current sample (Karthika & Vijayalakshmi, 2019). It may be explained by the fact that despite the changes that happen during adolescence, the difference in self-esteem is affected not so much by age as by social experience. Shared environmental stressor, which is disaster exposure in the current case, may cover age differences.

Contrary to that, the annual family income was identified as a statistically significant predictor of self-esteem of the adolescents but with very small effect size. Strikingly, the relation is negative, which means that higher incomes correspond to lower self-esteem levels. Previously, it has been demonstrated that the income of the household and social support has impact on the psychological state of adolescents after natural disaster where economically deprived adolescents are more vulnerable (Paul et al., 2015). The unexpected result may be explained by social comparison processes and higher expectations in high socio-economic groups. As has been stressed before, mere availability of resources does not guarantee the good state of mind of adolescents and social expectations may affect their self-image (Raj & Mathai, 2020). Research has found that there is a positive relation between social support and psychological well-being of adolescents and resilience may act as an important intermediary factor in it (Fu et al., 2022). Also, studies among adolescents who were disaster survivors have found that social support from family, peers, and community is positively related to resilience while persistent worries and lack of social resources may increase vulnerability (Wang et al., 2020). However, due to the small effect size, the finding must be interpreted carefully.

The absence of the independent effect of flood exposure in adjusted models shows that the adolescents under study may demonstrate resilience in environmental conditions. Earlier research has stressed that adolescent resilience is affected by multiple factors including social support, coping, and community resources. Additionally, it has been found that female adolescents suffer more from emotional distress in disaster conditions but rely more on relational coping. Thus, it can mitigate the effects of disasters. (Varughese & Purushothaman, 2021). The findings indicate that flooding has a quantifiable effect on self-esteem; however, this effect is relatively minor and predominantly shaped by socio-demographic and contextual variables. The findings highlight the necessity of a multidimensional approach to comprehending adolescent mental health in disaster contexts, especially from a gender-sensitive viewpoint.

Conclusion and Implications

From the current study, it is evident that flood exposure has a significant but negligible influence on the self-esteem of female adolescents. However, if the age and annual family income are put into consideration, it can be seen that the influence of flood exposure does not have significance in affecting the self-esteem outcomes, hence indicating the importance of socio-demographic factors in self-esteem outcome. Age did not prove to be a significant predictor of self-esteem; however, annual family income had a significant but weak relationship. The implication of the results above is far reaching and includes the following. Firstly, it shows the importance of designing interventions that address gender-specific mental health problems, particularly those of female adolescents in disaster-prone regions. Secondly, these results underscore the need for considering context and socio-economic determinants. In other words, interventions should not just consider the level of exposure but also the context of individuals within which they are being exposed to disasters. Lastly, schools and communities need to design programs that assist teens to

build resiliency through peer support groups, counseling and life skills training. With regard to policy formulation, it can be argued that disaster management strategies need to be designed with psychosocial frameworks for adolescent, especially female adolescents, in mind.

Limitations of the Study

The present study has certain limitations that should be considered while interpreting the findings. Firstly, the use of convenience sampling during the latter stage of sampling can affect the external validity of the findings as the sample may not be representative enough of the entire population of adolescent females in Kerala. Secondly, the cross-sectional design used by the study makes it impossible to determine causality between flood experiences and self-esteem of the participants. The study shows correlation at a particular point in time without considering changes and long-term effects associated with exposure to natural disasters. Thirdly, the present study is based on self-reporting which may suffer from the presence of various kinds of response biases such as social desirability and self-misinterpretation.

Scope for future research

Future research on the topic can further investigate using longitudinal designs that investigate changes over time in self-esteem of female adolescents after floods. In this way, future researchers will get an idea about whether the psychological effects of disasters are transient or continue at different phases of adolescence. The mixed method approach of research can also be used to understand the perceptions of adolescents, especially female adolescents, regarding the effects of floods. Future research may use larger geographic areas to enhance the validity of the results. Comparative research involving male adolescents may prove beneficial in investigating gender differences in disasters-related psychological consequences.

Declarations

Ethics approval and consent to participate.

This study was approved by the Institution Ethics Committee of the concern institution with the following Ethics Code: SU/R&D/IEC/2026/06/01. The present study follows the guidelines of the latest version of the Declaration of Helsinki. Each participant provided written informed consent to participate in the study.

Competing interests

The authors declare no competing interests.

Author Contributions

Author 2 and Author 3 contributed to the conceptualization of the study. Author 1 contributed to data collection, data analysis, and drafting the original manuscript. Authors 2 and 3 contributed to writing, reviewing, and editing the manuscript. All authors read and approved the final version.

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Availability of Data and Materials

The data may be provided on a genuine request from the corresponding author.

Consent for publication

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Reference

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